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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : G06F 17/00	A2	(11) International Publication Number: WO 00/63790 (43) International Publication Date: 26 October 2000 (26.10.00)
(21) International Application Number: PCT/IB00/00487 (22) International Filing Date: 19 April 2000 (19.04.00) (30) Priority Data: 09/294,026 20 April 1999 (20.04.99) US (71) Applicant: ALIS TECHNOLOGIES INC. [CA/CA]; Suite 600, 100 Alexis-Nihon Boulevard, Ville St. Laurent, Montreal, Quebec H4M 2P2 (CA). (72) Inventors: BOURBONNAIS, Jean; 4040 Trafalgar, Montreal, Quebec H3Y 1R2 (CA). WALKER, Martin; 89 Canterbury, Dollard-Des-Ormeaux, Quebec H9B 2G5 (CA).		(81) Designated States: BR, CA, CN, IN, JP, MX, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>Without international search report and to be republished upon receipt of that report.</i>
(54) Title: SYSTEM AND METHOD FOR NETWORK-BASED TELETRANSLATION (57) Abstract A network-based teletranslation system and method for translating documents from one natural language to another natural language. In one embodiment, the teletranslation system comprises a client application layer having a plurality of client applications, the client application layer receiving translation documents from one or more software applications and outputting a translated text, a server layer having a plurality of servers, each server having a plurality of filters, the server layer calling a plurality of filters in an appropriate order based on the translation request and existing parameters, each filter preprocessing a translation document to facilitate further preprocessing by subsequent filters, at least one of the filters processing the translation request and returning the translated document, and an intermediate layer coupling the client application layer to the server layer and arbitrating the translation documents among the servers in the server layer, wherein the teletranslation system handles a wide variety of language pairs and formats, and wherein the teletranslation system utilizes the computing power of the network in a scalable and flexible way, and wherein the teletranslation system increases the bandwidth and speed by distributing the translation request among the servers in the network.		

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SYSTEM AND METHOD FOR NETWORK-BASED TELETRANSLATION

I. Related Applications

This application is related to concurrently filed applications titled, "System and
5 Method for Enhancing Document Translatability", Attorney Docket No. 00184.0003,
commonly assigned, and "System and Method for Internet-based Translation
Brokerage Services", Attorney Docket No. 00184.0004, commonly assigned, and
incorporates the commonly assigned applications by reference in their entirety for all
purposes.

10 II. Field of the Invention

The present invention relates generally to language translation and, more
specifically, to a system and method for network-based teletranslation.

III. Description of the Related Art

Today, as more and more businesses operate across international borders, they
15 are often required to conduct business in more than one language. Also, businesses
often encounter a need to translate documents from one natural language to another
natural language.

In the past, businesses have utilized human-based translation (HT) to translate
documents. Although HT generally produces high quality work, it is labor intensive,
20 inherently slow, and often expensive. Human translators are quite often specialists in
a given language pair (e.g., English/French). Hence, there is a limitation on how the
human translators can be allocated to different translation tasks, thus resulting in
certain rigidity for a business employing the human translators.

Because HT is labor intensive, it is difficult to scale up when need increases
25 and difficult to scale down when need decreases. The capacity of any group of
translators is fairly well defined. When a sudden need arises to increase the capacity

for a particular language pair, adding additional translators to the process creates various problems, such as harmonizing different styles, sharing glossaries and context information, and merging translated text. Moreover, it can be difficult to hire additional translators when a sudden need arises.

5 The document to be translated is often submitted to the translators in different formats, for example, computer printouts, faxes, word processing files, e-mail attachments, web pages. The translators are then left to handle the formats and extract translatable contents. While requesters of translation services prefer that the translated document be in the same format as it was originally submitted, this is often
10 not possible, because different translators have varying technical skills and often are unable to reformat the translated document into the original format.

For these reasons, machine translation software programs, also known as machine translation engines, have been developed to provide computerized translations. Today, the term Machine Translation (MT) is widely used in the industry
15 to refer to computerized systems that translate documents from one natural language to another, with or without human assistance. It is important to note that the term MT does not include computer-based tools that support translators by providing access to dictionaries and terminology databases, or tools that facilitate the transmission and reception of machine-readable texts, or tools that interact with word processing, text
20 editing or printing equipment. The term MT does, however, include systems in which translators or other users assist computers in the production of translations, including combinations of text preparation, on-line interactions and subsequent revisions of machine translated documents.

While MT engines appear promising, the technology is often under-used or
25 miss-used. Businesses frequently encounter difficulty in determining the right use of MT and to evaluate the cost/benefit of MT. Businesses require a level of technical expertise to use MT (for example, computer, software and/or system management expertise), which is often not available. Access to various MT functionalities is not integrated with routine translation tasks in a business, making its use irregular at best.

Businesses unfamiliar with MT may not be aware that there is not one best MT engine for their particular business, but rather, the suitability of any particular MT engine depends on the application, which often varies even within a given business.

Consequently, a business may acquire a MT engine that is sub-optimal for its need.

5 MT engines often translate documents of only certain types of computer formats. For example, some MT engines accept rich text format (RTF) only, while others accept only ASCII files. As a result, businesses often are forced to turn down translation jobs because their MT engines cannot handle a particular computer format or at best implement a non-trivial way of extracting the text for translation from the
10 format information and reinserting the translated text back into the format information.

MT engines typically have a limited bandwidth, i.e., the amount of text they can translate in a given time period. If a business needs additional machine translation bandwidth, it must buy and setup additional MT engines. However, the ability to
15 dispatch translation jobs to various MT engines and balance the workload among the MT engines is not a trivial task. Failure to balance the workload among various MT engines results in under-performing equipment. More specifically, failure to balance the workload properly among various MT engines considerably slows down the time required to translate a document when compared to the combined output of the
20 separate MT Engines. On the other hand, failure to provide the necessary translation bandwidth to users results in lower productivity.

Even if businesses acquire new MT engines to meet increased demand or the need for new language pairs, the new MT engines are often incompatible with each other. Thus, businesses simply cannot connect a new MT engine to their existing
25 environment. The new MT engines are often not interchangeable with the old MT engines, and often do not work alongside the old MT engines.

For these reasons, it has been recognized that there is a need for a teletranslation system and method that is capable of handling a wide variety of language pairs and computer formats. There is a need for a teletranslation system and

method that is compatible with various MT engines, and that uses the computing power of the network in a scalable and flexible way. There is a need for a teletranslation system and method that increases the bandwidth and speed by distributing the workload among several computers in the network in a balanced way.

5

SUMMARY OF THE INVENTION

The present invention is a network-based teletranslation system and method that translates documents from one natural language to another natural language. In one embodiment, the teletranslation system comprises a client application layer having a plurality of client applications, the client application layer receiving
10 translation documents from one or more software applications and outputting a translated text, a server layer having a plurality of servers, each server having a plurality of filters, the server layer calling a plurality of filters in an appropriate order based on the translation request and existing parameters, each filter preprocessing a translation document to facilitate further preprocessing by subsequent filters, at least
15 one of the filters processing the translation request and returning the translated document, and an intermediate layer coupling the client application layer to the server layer and arbitrating the translation documents among the servers in the server layer, wherein the teletranslation system handles a wide variety of language pairs and formats, and wherein the teletranslation system utilizes the computing power of the
20 network in a scalable and flexible way, and wherein the teletranslation system increases the bandwidth and speed by distributing the translation request among the servers in the network.

In one embodiment, the present invention is a network-based filter architecture embodied in a teletranslation system for translating documents from one natural
25 language to another. The filter architecture comprises one or more atomic filters each programmed to perform a specific task, one or more aggregate filters constructed by combining other filters, the aggregate filters analyzing the translation request and

calling the other filters, and one or more load-balancing filters for distributing the translation request among aggregate filters to increase the speed of the teletranslation system and optimizing the computing power of the network.

In one embodiment, a method for translating documents from one natural language to another by a network-based teletranslation system comprises the steps of receiving the translation documents at a client application layer having a plurality of client applications and outputting translated documents, calling a plurality of filters at a sever layer in an appropriate order based on the translation documents and existing parameters, the server layer having a plurality of servers, preprocessing a translation document at each filter to facilitate further preprocessing by subsequent filters, translating a translation document at a machine translation engine in the server layer and returning the translated document, and arbitrating the translation documents by an intermediate layer among the servers.

In one embodiment, a method for translating documents from one natural language to another by a network-based teletranslation system comprises the steps of receiving the translation documents at a client application layer having a plurality of client applications and outputting translated documents, calling a plurality of filters at a sever layer in an appropriate order based on the translation documents and existing parameters, the server layer having a plurality of servers, preprocessing a translation document at each filter to facilitate further preprocessing by subsequent filters, translating a translation document through a human translation service accessed via a server in the server layer and returning the translated document, and arbitrating the translation documents by an intermediate layer among the servers.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The drawing in which an element first appears is indicated by the leftmost digit(s) in the reference number.

- 5 FIG. 1 is a block diagram of one embodiment of the teletranslation system.
- FIG. 2A illustrates a one-pass filter.
- FIG. 2B illustrates a two-pass filter.
- FIG. 3 illustrates various interfaces in a filter.
- FIG. 4 lists a sample of code sets supported by the teletranslation system.
- 10 FIGS. 5 and 6 illustrate two variations of an aggregate filter.
- FIG. 7 illustrates a load-balancing filter.
- FIG. 8 illustrates the distributed architecture of the teletranslation system.

DETAILED DESCRIPTION OF THE INVENTION

- The present invention is a system and method for teletranslation that translates
- 15 a document from one natural language to another. The teletranslation system and method is capable of handling a wide variety of formats, including HTML documents from the Internet, intranets or extranets, e-mails, or electronic documents from a word processor or other applications. The teletranslation system and method is compatible
- 20 with various MT engines and human translation services, and uses the computing power of a network in a scalable and flexible way. The teletranslation system and method increases the bandwidth and speed by distributing the workload among several computers in the network.

- In one embodiment, a user selects translation parameters through a user interface, such as a target language and the quality of translation. The system
- 25 processes the request based on the selected parameters, either through automated

translation and editing tools, or through a human translation service. The user automatically receives back the translated text in the same format as the original text.

Among the several parameters are translation request parameters, system-level parameters, system load conditions, system error conditions, number of words translated for each language pair, average performance of filters, and spare bandwidth capacity or lack thereof of the filters.

FIG. 1 is a block diagram of one embodiment of the teletranslation system. As shown in FIG. 1, the teletranslation system 100 comprises three layers: a client application layer 104; an intermediate layer 108; and a server layer 112.

10 The client application layer 104 receives translation requests from software applications interacting with the user and outputs a corresponding translated text. The client application layer 104 can contain a commercially available application that is translation enabled via such apparatus as plug-ins, such as Microsoft Word, Microsoft Explorer, Netscape Navigator, Lotus Notes, SAP Enterprise Applications, etc.

15 The intermediate layer 108 couples the client application layer 104 to the server layer 112. In one embodiment, the intermediate layer 108 is implemented as a distributed object architecture. In one embodiment, the intermediate layer 108 has two main elements: an application-programming interface (API) and a set of filter base classes. The filter base classes provide a common interface between the intermediate layer 108 and the server layer 112. The filter base classes integrate the linguistic and text processing functionality of the system. In one embodiment, a TCP/IP protocol couples the API to the filter base classes. The intermediate layer 108 arbitrates translation requests among various filters and servers in the server layer 112.

25 The intermediate layer 108 supports multiple clients and multiple filter configurations simultaneously. The intermediate layer 108 distributes the load efficiently among various filters in order to minimize translation times.

The intermediate layer 108 comprises means for detecting availability of individual filters over the network. Also, the intermediate layer 108 comprises means for detecting filter failures, means for reporting the failure, and means for correcting

the failure, i.e., replacing, restarting, rebooting, ignoring. Furthermore, the intermediate layer 108 comprises means for querying the state (on, off, load-level, number of errors, average throughput, etc.) of various filters and means for controlling the state of the various filters. These means are constructed through various interfaces of the filter object and available through the API. These means are also referred to as mechanisms or modules. Thus, the means for detecting filters, for example, is interchangeably referred to as a filter detection module or a filter detection mechanism. In one embodiment, the filter detection mechanism is an object locator that runs at the API level and uses various network communication technologies to locate and bind to the various filters on the network. To be able to do so, the filter base class implementation is able to respond to network wide calls from the object locator. Another implementation can have an object broker that can query for all the filters and cache the filter location locally to give faster response to the object locator. In one embodiment, the means for detecting filter failure in a linguistic tool is to monitor the process in which it runs. If it is detected that the process is frozen or no longer running, then it is automatically killed and restarted. Also, this is reported to the user and/or administrator. In one embodiment, the means for querying and the means for controlling the state of the filters are linguistic tool dependent, but in general they bind query and control parameters to operational parameters of the linguistic tools themselves. In one embodiment, these means are generic mechanisms for obtaining information about the linguistic tool and controlling it. The construction of the other means or modules are well known in the art.

The server layer 112 comprises one or more filters or combinations of filters via an aggregate filter. A filter is an object (or program) that is created to perform a specific function, such as translate a text from one natural language to another, remove certain tags from the text, etc. In operation, a server assembles (or calls) a group of filters in a selected order based on the type of translation request. Each filter preprocesses a translation request or a portion thereof to facilitate further

preprocessing by subsequent filters. Finally, the translation request is translated by a given MT engine or human translation service.

In general, filters can be broadly classified into two categories: one-pass filters, and two-pass filters. FIG. 2A illustrates a one-pass filter. A one-pass filter has a
5 single input terminal and a single output terminal. FIG. 2B illustrates a two-pass filter. A two-pass filter has a first pass comprising a first input-output terminal pair and a second pass comprising a second input-output terminal pair.

In one embodiment illustrated in FIG. 3, each filter provides the following interfaces.

- 10 (i) Input Interface: The input interface receives data.
- (ii) Output Interface: The output interface outputs data that is processed by the filter.
- (iii) Configuration Interface: The configuration interface allows the system to configure the filter from a remote location, such as update glossaries from a remote
15 location.
- (iv) Capabilities Interface: A filter provides information through this interface about its capabilities.
- (v) Status Interface: A filter provides the status of a job, such as position in the queue, wait time before processing, percentage of work done, etc.
- 20 (vi) Event Log Interface: A filter provides event logs via this interface.
- (vii) Diagnostic Interface: Remote diagnostics of a filter can be performed via the diagnostic interface. In one embodiment, each filter has a loop-back capability that allows debugging, diagnostics and performance testing. Each filter provides a mechanism to enable and disable trace logs for debugging purposes.

25 The filters are classified into three broad classes based on their functionality. These are atomic filters, aggregate filters, and load-balancing filters.

1. Atomic Filter

At the lowest level in the server layer, atomic filters perform a specific function on a document. As noted before, an atomic filter is a program (i.e., object) that performs a specific task. In one embodiment, third party tools and/or services
5 (whether linguistic or other) are wrapped within the atomic filters. All data processing functionality are performed in the atomic filters. The atomic filters can be combined in various orders and packages.

There are many different types of atomic filters. Each atomic filter is programmed to perform a specific type of task. Some of the atomic filters used in the
10 present invention are described below. It should be understood that there are many additional types of atomic filters that are not described in this document, but that they can be implemented in the present invention depending on the type of translation request. The actual implementation of different atomic filters is well known in the art, and thus, will not be described in this document.

15 (i) Language and Code Set Detection Filter

The Language and Code Set Detection Filter detects the language and code set of the document. This filter is called upon when the language and/or code set of a document is unknown to the system. In one embodiment, this filter supports the languages and code sets listed in Table I below. It should be understood that the
20 Language and Code Set Detection Filter can be configured to support other languages and code sets that are not listed in Table I.

Language	Abbr.	Suitable Code Sets
Albanian	sq	cp1252; cp850; Macintosh; utf8
Arabic	ar	cp1256; iso 8859-6; utf8
Basque	eu	Cp1252; cp850; Macintosh; utf8
Bulgarian	bg	Cp1251; iso 8859-5; utf8
Chinese	zh	gb2312; hz; big5; utf8
Croatian	sh	Cp1250; iso 8859-2; Macintosh-Croat; utf8
Czech	cs	Cp1250; iso 8859-2; utf8
Danish	da	Cp1252; cp850; Macintosh; utf8
Dutch	nl	Cp1252; cp850; Macintosh; utf8
English	en	Cp1252; utf8
Estonian	et	Iso 8859-4; utf8
Finnish	fi	Cp1252; cp850; Macintosh; utf8
French	fr	Cp1252; cp850; Macintosh; utf8
German	de	Cp1252; cp850; Macintosh; utf8
Greek	el	Cp1253; cp869; iso 8859-7; Macintosh-Greek; utf8
Hungarian	hu	Cp1250; cp852; utf8
Italian	it	Cp1252; cp850; Macintosh; utf8
Japanese	ja	euc-jp; iso 2022-jp; shift-jis; utf8
Korean	ko	Ks c 5601; iso 2022-kr; utf8
Malay	ms	Cp1252; cp850; Macintosh; utf8
Norwegian	no	Cp1252; cp850; Macintosh; utf8
Polish	pl	Cp1252; iso 8859-2; utf8
Portuguese	pt	Cp1252; cp850; Macintosh; utf8
Russian	ru	Cp1251; iso 8859-5; koi8-r; utf8
Spanish	es	Cp1252; cp850; Macintosh; utf8
Swedish	Sv	Cp1252; cp850; Macintosh; utf8
Thai	Th	Tis 620; utf8
Turkish	Tr	Cp853; iso 8859-9; utf8

(ii) Code Set Conversion Filter

The Code Set Conversion Filter converts a code set to another code set. FIG. 4 lists a sample of code sets supported by the code set conversion filter. It should be understood that the filter can be configured to support other code sets.

(iii) HTML Clean-Up Filter

The HTML Clean-Up Filter removes non-standard HTML constructs before they are processed by the system. This filter also ensures that HTML tags are not

embedded inside words. If HTML tags are embedded inside words, they may be misinterpreted by MT engines and translated as part of the data.

(iv) File Format Conversion Filter

5 The File Format Conversion Filter converts a translation request document to and from an internal data format to preserve the original formatting of the document after translation. In one embodiment, this filter supports the following file formats: plain text; HTML; OTEXT; Microsoft Word RTF; Microsoft Word DOC; and Adobe Acrobat PDF. It will be apparent to one skilled in the art that the File Format Conversion Filter can be configured to support other file formats.

10 (v) Summary Filter

The Summary Filter generates a summary of a document. Based on the summary, a user may determine that the document is not relevant, and thus a full translation of the document is not necessary. Also, the user may conclude, based on the summary, that machine translation should probably meet his quality requirements
15 in this specific case, and thereby decide to forego a costly and time consuming human translation of the document.

(vi) Language Marker Filter

The Language Marker Filter detects whether any part of a document is of a different language than the source text. If so, this filter tags that part of the text for
20 non-translation. In one embodiment, the tagged text can be translated using a MT engine supporting the necessary language pair, if available.

(vii) Reaccentuation Filter

The Reaccentuation Filter provides accented characters, where appropriate, in text written in a language with accents where in fact the user has omitted the accents, for example while using an English keyboard to type French text. This filter improves the quality of translation by ensuring that words are properly accented.

(viii) Spell Checker Filter

The Spell Checker Filter corrects misspelled words automatically where there is no ambiguity and interactively where there is, thus improving the quality of translation.

10 (ix) Grammar Checker Filter

The Grammar Checker Filter corrects the text automatically where there is no ambiguity and interactively where there are. Improper grammar confuses MT engines and produces poor quality translation. This filter ensures that the grammar is correct so that the MT engines can better translate the text.

15 (x) Controlled Language Filter

The Controlled Language Filter corrects the style of the text where appropriate and where there is no ambiguity. This filter ensures that the text adheres to a particular language style, thus guaranteeing consistent translations.

(xi) Linguistic Tag Filter

20 The Linguistic Tag Filter tags words that should not be translated by MT engines or should at least be treated differently. For example, this filter tags names of persons, geographical names, dates, and addresses.

(xii) Do Not Translate Filter

The Do Not Translate Filter tags a particular set of words, for example, proper nouns, that should not be translated. In one embodiment, this filter tags a particular set of words supplied prior to or with the translation request as not to be translated.

5 (xiii) Pre-Translate Filter

The Pre-Translate Filter translates words that are specific to the document being processed. This filter tags words appropriately so that MT engines will not attempt to translate these words. In one embodiment, this filter translates a particular set of words supplied prior to or with the translation request and where there is no
10 ambiguity in the translation.

(xiv) Translation Memory Filter

The Translation Memory Filter only translates text for which it has an appropriate translation already in its database, and marks it non-translatable. The translation memory alone is not sufficient to translate a complete text. In concert with
15 MT engines, this filter produces a higher quality translation.

(xv) MT Engine Filter

The MT Engine Filter corrects any idiosyncrasies that MT engines may have (e.g., rearrange dates, remove hyphens, insert too many spaces, etc.) and submits the text to the MT Engines themselves. This filter manages the list of words that the MT
20 Engine cannot translate. This list is preserved with reference to the original document along with the data and time the request was processed.

In one embodiment, the MT Engine Filter has a configuration parameter to disable any call to the corresponding MT engine and pass the data back to the client application. This filter also has a configuration parameter to limit the number of
25 concurrent requests per language pair. When this number of concurrent requests reaches the limit, the MT engine sends a "server too busy" response to the client

application. As noted before, the MT engines perform the bulk of the translation in the case where the user has requested MT in the translation request. These MT engines are commercially available and are manufactured by various vendors. It is important to note that the MT engines are also considered as atomic filters.

- 5 According to the present invention, the atomic filters pre-process the data in a predetermined order, and provide the pre-processed data to the MT engine. Thus, the atomic filters work in concert with the MT engines to provide a high quality translation. Each atomic filter performs a specific task. Many of these atomic filters and their functionality have been described above. The present invention assembles a
- 10 variety of atomic filters along with the MT engines to provide a high quality translation.

(xvi) Human Translation Services Filter

- The Human Translation Services Filter performs the translation in the case where the user has requested HT in the translation request. The HT Services Filter
- 15 takes care of submitting, via the network, the translation document to a human translation service and of tracking its return.

2. Aggregate Filter

- An aggregate filter is built from a combination of other filters. The types of filters in the aggregate filter depend on the translation request. The aggregate filter
- 20 analyzes a translation request and determines which filters are needed to perform the particular translation task. The aggregate filter may assemble atomic, load balancing and even other aggregate filters.

- In one embodiment, the aggregate filter is a generic implementation that is totally configurable. It accepts a list of filters and the order in which they must be
- 25 called as well as the location of the filter objects. The aggregate filter offers all the functionality offered through the interfaces of the various filters it assembles.

FIGS. 5 and 6 illustrate two variations of the aggregate filter in accordance with the present invention. Referring now to FIG. 5, an aggregate filter 500 is assembled with the following atomic filters: a code set conversion filter 504; a HTML file format conversion filter 508; and a linguistic tag filter 512. As will be realized, these atomic filters are two-pass filters. In the first pass, each atomic filter preprocesses the data and provides the data to the next atomic filter. Thus, the resulting aggregate filter 504 is in fact a two-pass filter. An external MT engine filter will eventually receive the data, translate the data, and return the data to the last atomic filter. The atomic filters in a reverse order process the data in their second pass.

Referring again to FIG. 5, in the first pass, the code set conversion filter 504 receives the data, converts the code, and outputs the data. Next, the HTML file format conversion filter 508 receives the data, removes non-standard HTML constructs, converts the HTML text to an internal data format, and outputs the data. Next, the linguistic tag filter 512 receives the data, tags words that should not be translated by the MT engine or should otherwise be treated differently, and provides the data to an external MT engine filter. The MT engine filter translates the text from one natural language to another, and returns the translated text to the linguistic tag filter 512.

In the second pass, the linguistic tag filter 512 removes the tags that were added in the first pass, and provides the data to the HTML file format conversion filter 508. The HTML file format conversion filter 508 converts the text in the internal data format back to its HTML format based on data generated in the first pass and returns the data to code set conversion filter 504. Code set conversion filter 504 converts the text back to the original code set and outputs the data.

Referring now to FIG. 6, an aggregate filter 600 is assembled with the aggregate filter 500 and the MT engine filter 604. Thus, FIG. 6 shows that an aggregate filter can be constructed using another aggregate filter and any other filters.

3. Load-Balancing Filter

At the highest level in the server layer, load-balancing filters divide the processing load among other filters of the same nature, including other load-balancing filters. The load-balancing filters divide the processing load in a way that provides a maximum throughput and increases the speed of the teletranslation system. Translation requests are dispatched to other filters in an intelligent fashion, such as according to processing power and current load.

FIG. 7 illustrates a load-balancing filter 700. Load-balancing filter 700 comprises aggregate filters 704 and 708. The aggregate filters 704 and 708 have identical construction and are constructed like the aggregate filter 500.

In one embodiment, a two-state switch S connects the load-balancing filter 700 to the server. In its first state, the switch S connects the aggregate filter 704 to the server layer while it disconnects the aggregate filter 708 from the server layer. Thus, in the first state, the translation request is routed through the aggregate filter 704. In its second state, the switch S connects the aggregate filter 708 to the server layer while it disconnects the aggregate filter 704 from the server layer. Thus, in the second state, the translation request is routed through the aggregate filter 708. The switch S selects either the aggregate filter 704 or aggregate filter 708 depending on their current workload, maximum capacity, and other conditions.

The filter architecture according to the present invention allows any MT engine and/or any HT services to be added to the teletranslation system. Thus, a business can add new MT engines and/or any HT services as needed. The filter architecture of the present invention optimizes the use of the MT engines and/or any HT services by performing a variety of pre-processing ("first-pass") or post-processing ("second-pass") functions. The filter architecture allows the filters to be interchangeable based on the nature of their inputs and outputs. In other words, filters act like black boxes that are defined in terms of their input and output rather than in terms of their internal process.

In one embodiment, the teletranslation system includes means for "chunking", which means dividing a large translation request into small chunks inside an aggregate filter. The means for chunking can be a chunking filter, which is a type of an atomic filter. The chunking filter divides the translation request into small chunks and
5 supplies the chunks to a MT engine. This way, if data is lost in the MT engine during the translation (for example, because of a flaw in the MT engine causing it to abort once in a while), only a given chunk of data, and not the entire large translation request, is lost.

In another embodiment, the chunking mechanism above will permit a filter to
10 start processing the data without receiving the full text of the document. Since, the translation is done by processing chunks of data, users can obtain faster feedback regarding the progress of the translation work as each filter completes its portion of the translation work. In fact, users can receive updates while the client application layer has yet to feed the entire translation request.

15 FIG. 8 illustrates the distributed architecture of a teletranslation system 800 in accordance with one embodiment of the present invention. A client application layer 804 comprises a client HTTP Browser, a console and other client applications.

An intermediate layer 808 comprises an HTTP server, a filter interface and an OEM protocol. A server layer 812 comprises several filters, including a linguistic
20 filter, an HTML filter, an aggregate filter, and various MT Engine filters. Each filter can reside in a separate computer, but they are not required to do so.

The distributed architecture of the present invention provides a flexible and scalable way to utilize the computing power of computers in the network. In the present invention, multiple translation requests can be accepted from various sources
25 on a network. The translation requests can be dispatched among those computers that have been identified as having the necessary translation capabilities, i.e., available bandwidth, processing speed, etc.

The teletranslation system and method in accordance with the present invention accepts documents having a variety of different formats. Using the File

Format Conversion Filter, the teletranslation system converts a translation request document as necessary for processing by the various filters and returns it after in its original format.

5 In an embodiment where the invention is implemented using software, the software may be stored in a computer program product and loaded into a computer system using a removable storage drive or a hard drive. The software may be stored in a CD-ROM, a floppy disk or any other type of storage device.

10 In another embodiment, the invention can be implemented primarily in hardware using, for example, hardware components such as application specific integrated circuits (ASICs). Implementation of such a hardware state machine so as to perform the functions described herein will be apparent to persons skilled in the relevant art(s). In yet another embodiment, the invention is implemented using a combination of both hardware and software.

15 While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

1 **WHAT IS CLAIMED IS:**

2 1. A network-based teletranslation system for translating documents from
3 one natural language to another, comprising:

4 a client application layer having a plurality of client applications, the client
5 application layer receiving the translation documents from one or more software
6 applications and outputting translated documents;

7 a server layer having a plurality of filters, the server layer calling a plurality of
8 filters in an appropriate order based on the translation documents and existing
9 parameters, each filter preprocessing a translation document to facilitate further
10 preprocessing by subsequent filters, the server layer having a plurality of machine
11 translation engines for translating the translation request document and returning the
12 translated document; and

13 an intermediate layer coupling the client application layer to the server layer
14 and arbitrating the translation documents among the filters in the server layer,

15 wherein the teletranslation system is capable of handling a wide variety of
16 formats and utilizes the computing power of the network in a scalable and flexible
17 way, and wherein the bandwidth and the speed of the teletranslation system is
18 increased by distributing the translation requests among the servers in the network.

1 2. The network-based teletranslation system as recited in claim 1, wherein
2 the client application layer further comprises interfaces and plug-ins adapted to the
3 software applications.

1 3. The network-based teletranslation system as recited in claim 1, wherein
2 the intermediate layer further comprises:

3 a distributed object application programming interface; and

4 detection module for detecting availability of filters in the network.

1 4. The network-based teletranslation system as recited in claim 1, wherein
2 the intermediate layer supports multiple clients and multiple filter configurations
3 simultaneously.

1 5. The network-based teletranslation system as recited in claim 1, wherein
2 the intermediate layer distributes the workload among various filters in order to
3 minimize translation times.

1 6. The network-based teletranslation system as recited in claim 1, wherein
2 the intermediate layer further comprising:
3 detection modules for detecting filter failures;
4 reporting modules for reporting the failures; and
5 correction modules for correcting the failures.

1 7. The network-based teletranslation system as recited in claim 1, wherein
2 the intermediate layer further comprising:
3 query modules for querying the state and capabilities of various filters; and
4 control modules for controlling the state of the various filters.

1 8. The network-based teletranslation system as recited in claim 1, wherein
2 the existing parameters are translation request parameters, system-level parameters,
3 system load conditions, and system error conditions.

1 9. A network-based filter architecture embodied in a teletranslation
2 system for translating documents from one natural language to another, the filter
3 architecture utilizing the computing power of the network in a scalable and flexible
4 way, and increasing the bandwidth and speed of the teletranslation system by
5 distributing the translation request among various filters in the network, the filter
6 architecture comprising:
7 one or more atomic filters each programmed to perform a specific task;

8 one or more aggregate filters constructed by combining other filters, the
9 aggregate filter analyzing the translation request and calling the other filters; and
10 one or more load balancing filters distributing the translation request among
11 aggregate filters to increase the speed of the teletranslation system and optimizing the
12 computing power of the network.

1 10. The network-based filter architecture as recited in claim 9, wherein the
2 aggregate filter comprises one or more atomic filters.

1 11. The network-based filter architecture as recited in claim 9, wherein the
2 aggregate filter comprises one or more aggregate filters.

1 12. The network-based filter architecture as recited in claim 9, wherein the
2 aggregate filter comprises one or more load-balancing filters.

1 13. The network-based filter architecture as recited in claim 9, wherein the
2 aggregate filter comprises a combination of one or more atomic, aggregate and load-
3 balancing filters.

1 14. A method for translating documents from one natural language to
2 another by a network-based teletranslation system, comprising the steps of:
3 receiving the translation documents at a client application layer having a
4 plurality of client applications and outputting translated documents;
5 calling a plurality of filters at a server layer in an appropriate order based on
6 the translation documents and existing parameters, the server layer having a plurality
7 of filters;
8 preprocessing a translation document at each filter to facilitate further
9 preprocessing by subsequent filters;
10 translating a translation request document at a machine translation engine in
11 the server and returning the translated document; and

12 arbitrating the translation request documents by an intermediate layer among
13 the servers.

1 15. The method as recited in claim 14, further comprising the step of
2 distributing the translation documents among various filters in order to
3 minimize translation times.

1 16. A method for translating documents from one natural language to
2 another natural language by a network-based filter architecture embodied in a
3 teletranslation system, the filter architecture utilizing the computing power of the
4 network in a scalable and flexible way, the method increasing the bandwidth of the
5 teletranslation system by distributing the translation documents among various filters
6 in the network, the method comprising the steps of:

7 performing specific tasks by one or more atomic filters;
8 analyzing the translation request documents by one or more aggregate filters
9 and calling the other filters; and
10 distributing the translation request documents by one or more load-balancing
11 filters among aggregate filters to optimize the computing power of the network.

1 17. The method as recited in claim 16, wherein the aggregate filter
2 comprises one or more atomic filters.

1 18. The method as recited in claim 16, wherein the aggregate filter
2 comprises one or more aggregate filters.

1 19. The method as recited in claim 16, wherein the aggregate filter
2 comprises one or more load-balancing filters.

1 20. The method as recited in claim 16, wherein the aggregate filter
2 comprises a combination of one or more atomic, aggregate and load-balancing filters.

1 21. A program storage device readable by a machine, tangibly embodying a
2 program of instructions executable by the machine to perform method steps of
3 translating documents from one natural language to another by a network-based
4 teletranslation system, the method comprising the steps of:

5 receiving the translation documents at a client application layer having a
6 plurality of client applications and outputting translated documents;

7 calling a plurality of filters at a server layer in an appropriate order based on
8 the translation documents and existing parameters, the server layer having a plurality
9 of filters;

10 preprocessing a translation document at each filter to facilitate further
11 preprocessing by subsequent filters;

12 translating a translation request document at a machine translation engine in
13 the server and returning the translated document; and

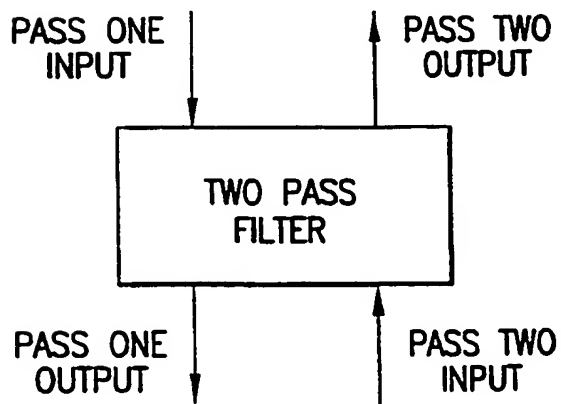
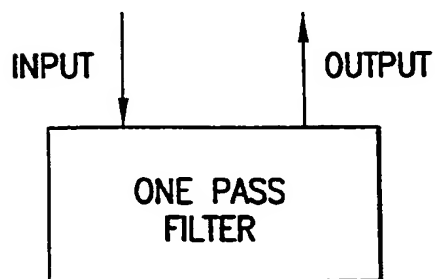
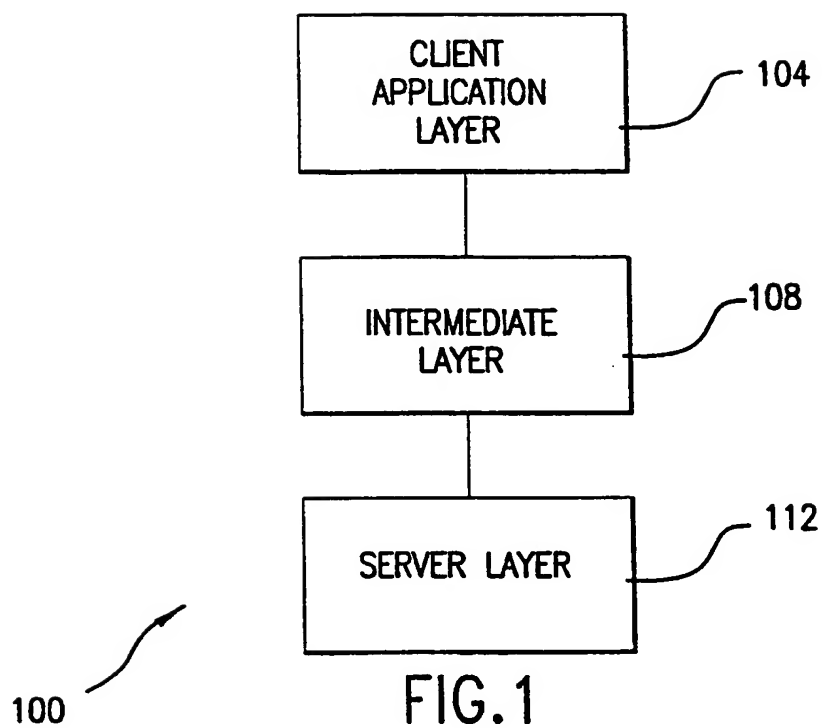
14 arbitrating the translation request documents by an intermediate layer among
15 the servers.

1 22. The program storage device as recited in claim 21, wherein the
2 aggregate filter comprises one or more atomic filters.

1 23. The program storage device as recited in claim 21, wherein the
2 aggregate filter comprises one or more aggregate filters.

1 24. The program storage device as recited in claim 21, wherein the
2 aggregate filter comprises one or more load-balancing filters.

1 25. The program storage device as recited in claim 21, wherein the
2 aggregate filter comprises a combination of one or more atomic, aggregate and
3 load-balancing filters.



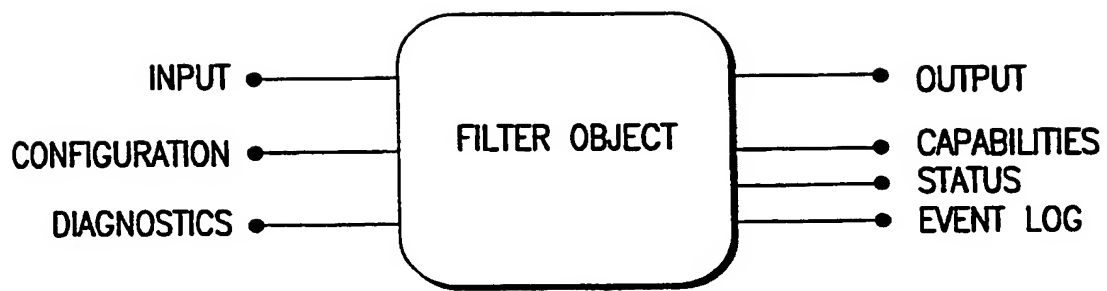


FIG.3

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• ASMO-708-FR	• GB2312	• KOI8	• UCS-2
• ASMO-708-Plus	• HZ	• KOI8-R	• US-ASCII
• Big5	• ISCII	• KSC5601	• UTF-7
• CP437	• ISIRI-3342	• Macintosh Arabic	• UTF-8
• CP737	• ISO-2022-JP	• Macintosh Croatian	• VISCII
• CP775	• ISO-2022-KR	• Macintosh Cyrillic	• VIQR
• CP850	• ISO-8859-1	• Macintosh Eastern Eur.	• VNCII
• CP852	• ISO-8859-2	• Macintosh Greek	• VietNet
• CP853	• ISO-8859-3	• Macintosh Icelandic	• Windows 1250
• CP855	• ISO-8859-4	• Macintosh Roman	• Windows 1251
• CP857	• ISO-8859-5	• Macintosh Romanian	• Windows 1252
• CP860	• ISO-8859-6	• Macintosh Turkish	• Windows 1253
• CP861	• ISO-8859-7	• Macintosh Ukrainian	• Windows 1255
• CP863	• ISO-8859-8	• MS_1368	• Windows 1255-V
• CP864	• ISO-8859-8-I	• Murasu	• Windows 1256
• CP865	• ISO-8859-9	• Mylai	• Windows 1257
• CP866	• ISO-8859-15	• Shift-JIS	• Windows 1258
• CP869	• Jawi-AI-Arabi	• TamilNet	
• EUC-JP	• Kamenicky	• TIS-620	

FIG.4

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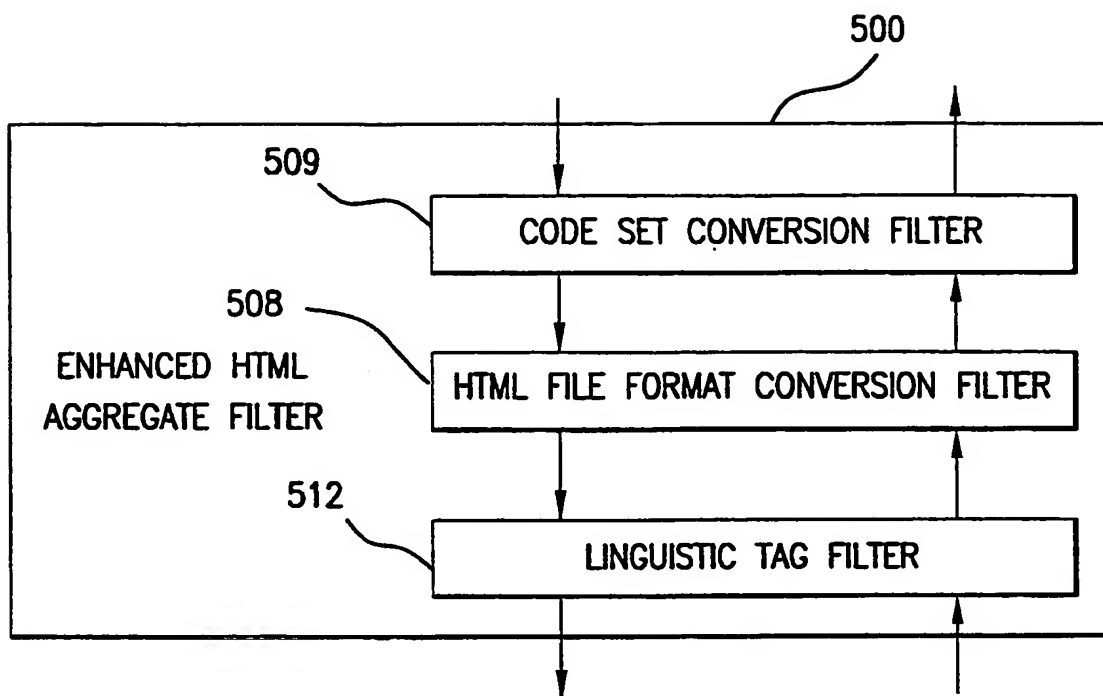


FIG.5

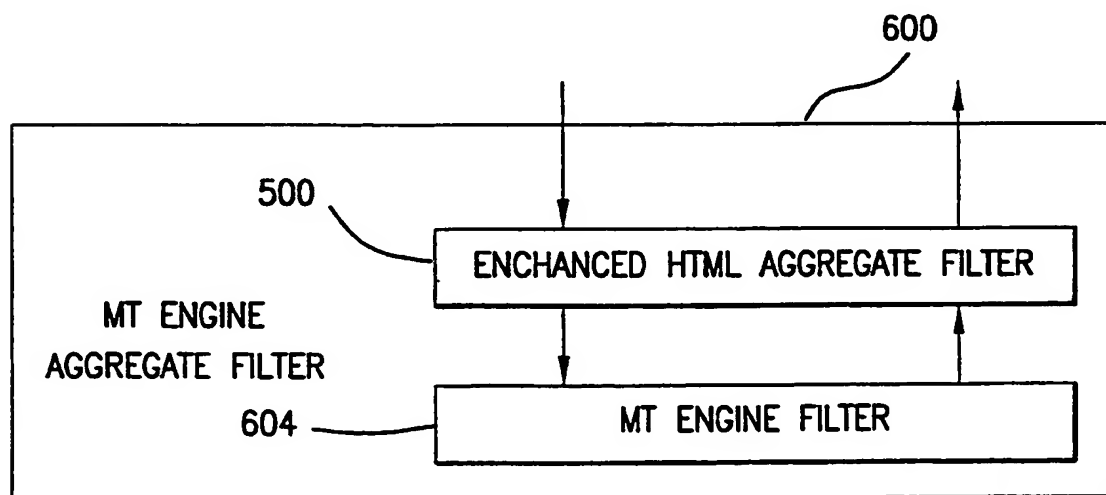


FIG.6

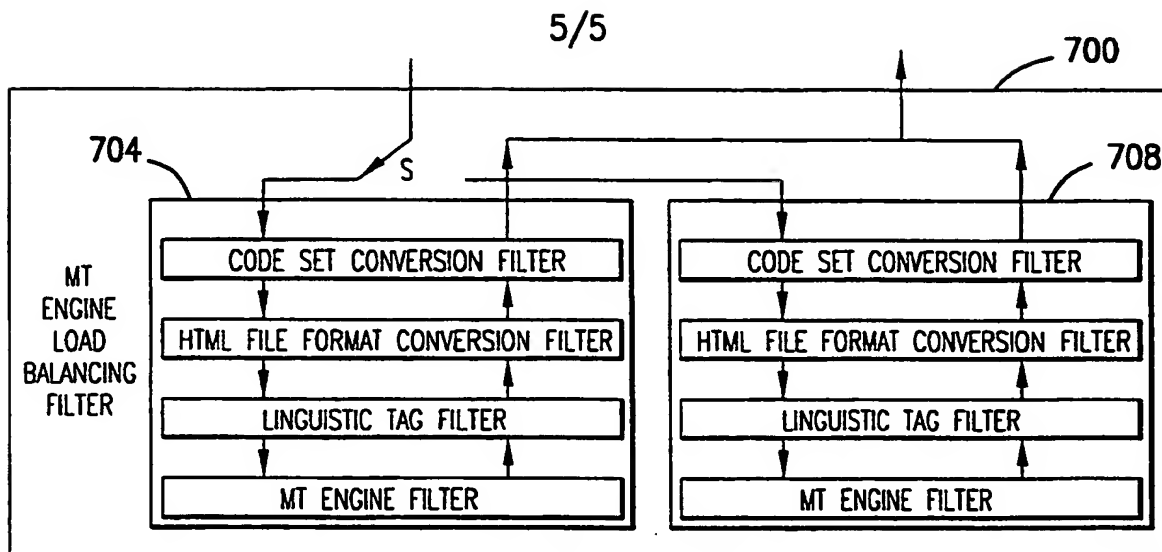


FIG. 7

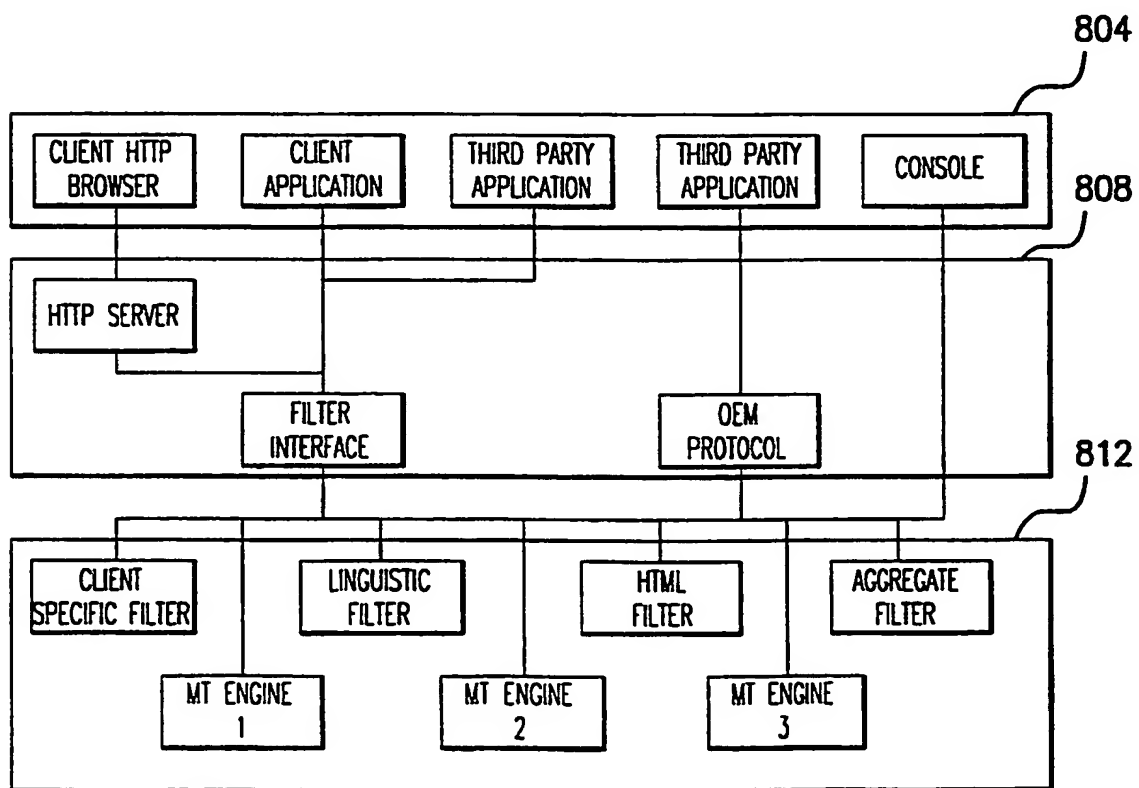


FIG. 8

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
26 October 2000 (26.10.2000)

PCT

(10) International Publication Number
WO 00/63790 A3

- (51) International Patent Classification⁷: **G06F 17/28** 89 Canterbury, Dollard-Des-Ormeaux, Quebec H9B 2G5 (CA).
- (21) International Application Number: **PCT/IB00/00487**
- (22) International Filing Date: 19 April 2000 (19.04.2000) (81) Designated States (*national*): BR, CA, CN, IN, JP, MX.
- (25) Filing Language: English (84) Designated States (*regional*): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
- (26) Publication Language: English
- (30) Priority Data: 09/294,026 20 April 1999 (20.04.1999) US Published:
— With international search report.
- (71) Applicant: **ALIS TECHNOLOGIES INC. [CA/CA];** Suite 600, 100 Alexis-Nihon Boulevard, Ville St. Laurent, Montreal, Quebec H4M 2P2 (CA). (88) Date of publication of the international search report:
1 March 2001
- (72) Inventors: **BOURBONNAIS, Jean; 4040 Trafalgar,** Montreal, Quebec H3Y 1R2 (CA). **WALKER, Martin;**
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



(54) Title: **SYSTEM AND METHOD FOR NETWORK-BASED TELETRANSLATION**

(57) Abstract: A network-based teletranslation system and method for translating documents from one natural language to another natural language. In one embodiment, the teletranslation system comprises a client application layer having a plurality of client applications, the client application layer receiving translation documents from one or more software applications and outputting a translated text, a server layer having a plurality of servers, each server having a plurality of filters, the server layer calling a plurality of filters in an appropriate order based on the translation request and existing parameters, each filter preprocessing a translation document to facilitate further preprocessing by subsequent filters, at least one of the filters processing the translation request and returning the translated document, and an intermediate layer coupling the client application layer to the server layer and arbitrating the translation documents among the servers in the server layer, wherein the teletranslation system handles a wide variety of language pairs and formats, and wherein the teletranslation system utilizes the computing power of the network in a scalable and flexible way, and wherein the teletranslation system increases the bandwidth and speed by distributing the translation request among the servers in the network.

WO 00/63790 A3

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 00/00487

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06F17/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EPO-Internal, PAJ, IBM-TDB, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	O'HAGAN: "Translating in cyberspace: the coming industry of teletranslation" ASLIB PROCEEDINGS, vol. 47, no. 2, February 1995 (1995-02), pages 41-46, XP000612596 the whole document	1-25
A	US 5 734 903 A (SAULPAUGH ET AL) 31 March 1998 (1998-03-31) column 1, line 20 -column 3, line 14	1-25
A	US 5 867 651 A (DAN ET AL) 2 February 1999 (1999-02-02) the whole document	1-25

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Date of mailing of the international search report

02/11/2000

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5734903 A	31-03-1998	AU 2465795 A EP 0791196 A JP 10500507 T WO 9531780 A	05-12-1995 27-08-1997 13-01-1998 23-11-1995
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